

Appl. No. 09/994,199

Amd. Dated July 19, 2004

Reply to Office Action Dated March 17, 2004

IN THE CLAIMS:

Please amend the claims as follows. No new matter has been added by way of these amendments.

1. (Previously and Currently Amended) A method of identifying the presence of hydrogen sulfide in a wellbore penetrating a subterranean formation, comprising:

lowering a ~~downhole~~ formation evaluation tool comprising at least one sample of material operatively connected thereto into the wellbore such that the material is exposed to fluid in the wellbore, the coupon being optically reactive to the presence of hydrogen sulfide; and

determining whether an optical reaction has occurred to the at least one sample of material.

2. (Previously Amended) The method of claim 1, further comprising:

inspecting the at least one sample of material at the surface for an optical reaction.

3. (Previously Amended) The method of claim 1, further comprising:

inspecting the optical reaction of the at least one sample of material to estimate the quantity of hydrogen sulfide contained in the fluid.

4. (Previously Amended) The method of claim 1, further comprising: retrieving the tool from the wellbore.

5. (Original) The method of claim 1, further comprising:

taking temperature readings of the reservoir fluid.

6. (Previously Amended) The method of claim 1, further comprising:

taking temperature readings of the reservoir fluid;

inspecting the at least one sample of material for exposure to hydrogen sulfide; and

estimating the hydrogen sulfide content of the reservoir fluid based upon the inspection of the optical reaction of the at least one sample of material and the temperature readings of the reservoir fluid.

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7. (Previously Amended) The method of claim 1, wherein the at least one sample of material is selected from a group comprising chromium, nickel and steel alloys.
8. (Previously Amended) The method of claim 1, further comprising:
detecting an optical reaction of the at least one sample of material with a sensor.
9. (Previously Amended) The method of claim 8, further comprising:
transmitting a signal indicating an optical reaction of the at least one sample of material.
10. (Previously and Currently Amended) A method for identifying the presence of hydrogen sulfide in a subsurface formation penetrated by a wellbore, comprising:
lowering a downhole formation evaluation tool into the wellbore, the tool comprising a housing, at least one sample of material with a surface that is optically reactive to the presence of hydrogen sulfide, and at least one passage for conducting formation fluid to the sample of material;
delivering formation fluid to the sample of material via the passage;
retrieving the downhole formation evaluation tool from the wellbore; and
inspecting the sample of material for an optical reaction.
11. (Previously Amended) The method of claim 10, wherein the at least one sample of material is selected from a group comprising chromium, nickel and steel alloys.
12. (Previously Amended) The method of claim 10, wherein the tool comprises a plurality of optically reactive coupons, the coupons capable of different optical reactions in response to varying hydrogen sulfide concentrations.
13. (Previously Amended) The method of claim 10, further comprising:
taking temperature readings of the formation fluid;
inspecting the optical reaction of the at least one sample of material to determine if hydrogen sulfide is present; and

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- estimating the hydrogen sulfide content of the fluid utilizing the optical reaction on the surface of the at least one sample of material and the temperature readings of the formation fluid.
14. (Previously and Currently Amended) The method of claim 10, further comprising:
transporting formation fluid through the downhole formation evaluation tool; and
collecting formation fluid samples within the downhole formation evaluation tool.
15. (Previously and Currently Amended) A method for identifying the presence of hydrogen sulfide in a subsurface formations penetrated by a wellbore, comprising the steps of:
lowering a downhole formation evaluation tool into the wellbore, the tool including a housing having at least one sample of material that is reactive to the presence of hydrogen sulfide and a passage for conducting formation fluid to the sample of material;
delivering formation fluid to the sample of material via the passages;
retrieving the downhole formation evaluation tool from the wellbore; and
inspecting the sample of material for an optical reaction.
16. (Original) The method of claim 15, wherein the sample of material is a metal.
17. (Previously Amended) The method of claim 16, wherein the metal is selected from a group comprising copper and nickel alloys.
18. (Original) The method of claim 15 wherein the sample of material reacts to hydrogen sulfide by changing color.
19. (Previously and Currently Amended) A method of reservoir analysis, comprising:
lowering ~~a the~~ downhole formation evaluation tool into a wellbore that penetrates a reservoir, the downhole formation evaluation tool comprising at least one sample of material that is optically reactive to the presence of hydrogen sulfide;
flowing formation fluid through the downhole formation evaluation tool;
exposing the at least one sample of material to formation fluid upon the formation fluid

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- entry into the wellbore;
- taking temperature readings of the formation fluid;
- collecting formation fluid samples within the downhole formation evaluation tool;
- retrieving the downhole formation evaluation tool from the wellbore;
- inspecting the at least one sample of material for an optical reaction; and
- estimating the hydrogen sulfide content of the formation fluid within the reservoir
utilizing the inspection of the optical reaction of the at least one sample of
material and the temperature readings of the formation fluid.
20. (Previously and Currently Amended) A downhole formation evaluation tool, comprising:
a housing; and
at least one sample of material operatively connected to the housing, the at least one
sample of material being optically reactive to the presence of hydrogen sulfide
positioned in the housing;
wherein the at least one sample of material is adapted to be exposed to reservoir fluid
upon the reservoir fluid entry into the apparatus.
21. (Previously and Currently Amended) The downhole formation evaluation tool of claim
20, wherein the sample of material is a metal.
22. (Previously and Currently Amended) The downhole formation evaluation tool of claim
21, wherein the metal is selected from a group comprising chromium, nickel
and steel alloys.
23. (Previously and Currently Amended) The downhole formation evaluation tool of claim
20, wherein the sample of material reacts to hydrogen sulfide by changing color.
24. (Previously and Currently Amended) The downhole formation evaluation tool of claim
20, further comprising a temperature sensor.
25. (Previously and Currently Amended) The downhole formation evaluation tool of claim
20, further comprising a pressure sensor.

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26. (Previously and Currently Amended) The ~~downhole~~ formation evaluation tool of claim 20, wherein the at least one sample of material comprise removable coupons.
27. (Previously and Currently Amended) The ~~downhole~~ formation evaluation tool of claim 20, wherein the at least one sample of material comprises removable coupons having different reactive responses to hydrogen sulfide.
28. (Previously and Currently Amended) The ~~downhole~~ formation evaluation tool of claim 20, wherein the housing further comprises a coupon holder that is resistant to hydrogen sulfide, the housing capable of retaining the at least one sample of material.
29. (Previously and Currently Amended) The ~~downhole~~ formation evaluation tool of claim 20, wherein the apparatus comprises at least three hydrogen sulfide detection coupons.
30. (Previously and Currently Amended) The ~~downhole~~ formation evaluation tool of claim 20, wherein the apparatus further comprises a sensor capable of detecting a an optical reaction in the at least one sample of material.
31. (Previously and Currently Amended) The ~~downhole~~ formation evaluation tool of claim 30, wherein the sensor is capable of transmitting a signal indicating an optical reaction in the at least one sample of material.
32. (Previously and Currently Amended) A ~~downhole~~ formation evaluation tool, comprising:
 - a plurality of coupons that are optically reactive to the presence of hydrogen sulfide;
 - a housing capable of retaining the coupons and having a passage for communicating formation fluids between a wellbore and the coupons;
 - a temperature sensor;
 - a probe capable of flowing formation fluids into the ~~downhole~~ formation evaluation tool;
 - wherein when the formation fluids are pumped through the ~~downhole~~ formation evaluation tool the coupons are exposed to the formation fluid upon the formation fluid entry into the ~~downhole~~ formation evaluation tool; and
 - wherein the surface of the plurality of coupons are capable of changing color upon

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contact with hydrogen sulfide and can be interpreted to determine the hydrogen sulfide content in the formation fluids.

33. (Previously and Currently Amended) The ~~dew~~hole formation evaluation tool of claim 32, wherein the ~~dew~~hole formation evaluation tool further comprises a sensor capable of detecting an optically reaction in the at least one sample of material as a result of detecting hydrogen sulfide.
34. (Previously and Currently Amended) The ~~dew~~hole formation evaluation tool of claim 33, wherein the sensor is capable of transmitting a signal indicating an optically reaction in the at least one sample of material as a result of detecting hydrogen sulfide.
35. (Previously and Currently Amended) An apparatus for identifying the presence of hydrogen sulfide in a wellbore penetrating a subsurface formation, comprising:
a ~~dew~~hole formation evaluation tool including a housing having at least one sample of material that is reactive to the presence of hydrogen sulfide, the housing having a passage for conducting formation fluid to the sample of material when the ~~dew~~hole formation evaluation tool is lowered into the wellbore.
36. (Original) The apparatus of claim 35, wherein the sample of material is a metal.
37. (Previously Amended) The apparatus of claim 36, wherein the metal is selected from a group comprising copper and nickel alloys.
38. (Original) The apparatus of claim 35 wherein the sample of material reacts to hydrogen sulfide by changing color.